

Name (FIRST & LAST) PRINT: _____

*This question booklet (all pages) must be turned in at the end of the exam **WITH YOUR NAME LEGIBLY PRINTED ON IT** in order to receive credit for this exam. Note that only responses marked on the answer sheet will be counted (make sure question and answer numbers match). If you feel a question is unfair or ambiguous or has more than 1 right answer, write the question # **and your reasons** on the **LAST PAGE** of the booklet. This exam is supervised by trained proctors. Cheating of any kind may result in loss of credit for this exam and possible disciplinary action.*

Choose the best answer

1. A characteristic of olfactory receptor cells is (are):
 - A. Receptors for odorants on cilia
 - B. Thin unmyelinated axons
 - C. Regeneration about every 60 days
 - D. Cilia processes in mucus layer of olfactory epithelium
 - E. All of the above
2. Some axons from the anterior olfactory nucleus cross the midline in the:
 - A. Pyramidal decussation
 - B. Corpus callosum
 - C. Posterior commissure
 - D. Anterior commissure
 - E. Massa intermedia
3. The main ascending olfactory pathway involves:
 - A. Receptor cells to mitral cells to olfactory cortex pyramidal cells
 - B. Basal cells to receptor cells to periglomerular cells
 - C. Primary olfactory nerve fibers to tufted cells to ventral posteromedial nucleus neurons to postcentral gyrus pyramidal cells
 - D. Basal cells to granule cells to Purkinje cells
 - E. Primary olfactory nerve fibers to mitral cells to superior colliculus cells to pulvinar cells to insular cortex pyramidal cells
4. Taste sensations from the circumvallate papillae are carried to the brain primarily by which cranial nerve:
 - A. Facial
 - B. Abducens
 - C. Vagus
 - D. Hypoglossal
 - E. Glossopharyngeal

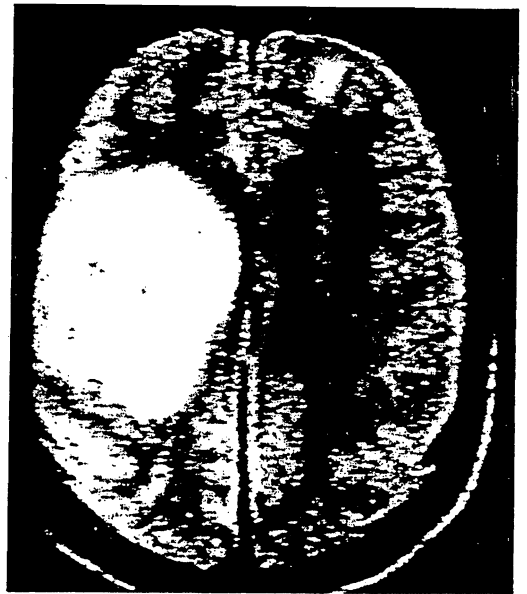
5. Axons of secondary neurons for taste are located in:
- A. Central tegmental tract
 - B. Medial lemniscus
 - C. Trapezoid body
 - D. Stria medullaris
 - E. Juxtarestiform body
6. Which statement is **not** true concerning taste disorders?
- A. Head trauma can lead to loss of taste sensation
 - B. Gustatory hallucinations may precede seizures
 - C. Loss of taste may follow middle ear surgery
 - D. Occipital lobe lesions typically produce gustatory hallucinations
 - E. Loss of taste may follow surgery to remove an eighth nerve tumor
7. A 24 year old man begins to experience delusions and hallucinations. He believes that voices from the radio control his life. He is seen by a physician and placed on psychotropic medications which substantially help him. The following are true **EXCEPT**:
- A. Cranial nerves, motor, sensory, cerebellar, gait testing are typically normal.
 - B. This disease involves receptor abnormalities in the limbic system
 - C. Imaging techniques (C.T./M.R.I.) do not reveal a structural defect
 - D. Mental status testing is almost always normal
 - E. Delusional, paranoid types of this illness can be dangerous
8. A 26 year old woman with a history of febrile convulsions develops the onset of complex partial or temporal lobe seizures. She may exhibit or experience all of the following **EXCEPT**:
- A. Automatisms, staring
 - B. Aura of peculiar odors, something "burnt or rotten"
 - C. C.T. or M.R.I. may show mesial temporal sclerosis or atrophy
 - D. Hemi-sensory and hemi-motor disturbances
 - E. Temporal lobe electroencephalographic abnormalities
9. One of the following is **NOT** involved with the limbic system or limbic disease
- A. Kluver-Bucy Syndrome
 - B. CA1 of the hippocampus (Sommer's sector)
 - C. Posterior cingulate and retrosplenial cortex
 - D. mammilo-thalamic tract
 - E. none of the above (i.e. all are limbic structures)

> Right < All Scans → Left

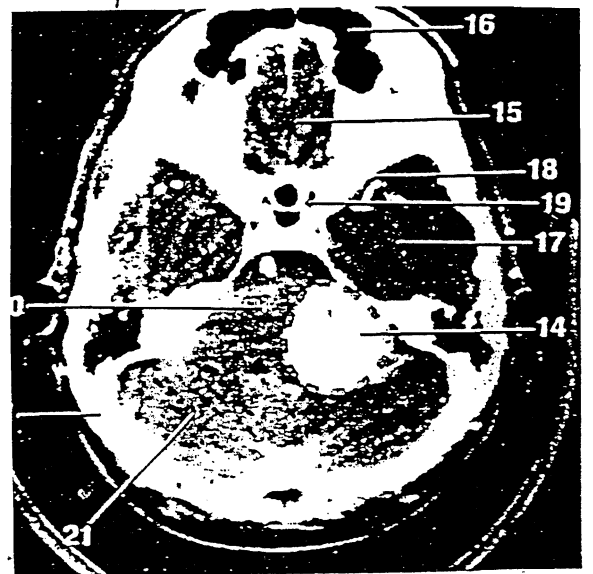
A.



B.



C.



10. This question refers to brain scan A: This 58 year old man was brought to his family physician by his wife because of personality changes. The M.R.I scan shows a large, midline glioma, which did not invade any subcortical structures except those visible at this scan level. The following clinical features may characterize his exam **EXCEPT**:

- A. Spastic bulbar (pseudobulbar) palsy
- B. Bilateral central visual field defects
- C. Decreased attention, rigidity of thinking
- D. Variable grasping, avoiding and gait decompensation
- E. None of the above (all may be evident)

11. This question refers to brain scan B: A 59 year old right handed (left brain dominant) man with a history of 40+ pack years of cigarette smoking develops a persistent cough and headache and the onset of left sided weakness. This tumor would produce WHICH of the following:

- A. Spatial disturbance, constructional apraxia, prosopagnosia, visual neglect
- B. Wernicke's aphasia and upper quadrantanopsia
- C. Unformed hallucinations and Anton's syndrome
- D. Disturbed optokinetic nystagmus and Broca's aphasia
- E. None of the above would occur

12. This question refers to brain scan C: The pathology in this scan can present in the following ways:

- A. Decreased hearing
- B. Loss of corneal reflex
- C. Decreased pain sensitivity on left face and right lower body
- D. Inward (nasal) deviation of left eye
- E. All of the above

13. A 28 year old man slips and falls on icy pavement and sustains a fracture of the right occipital bone and contusion of the right occipital lobe of his brain. His neurological difficulties might consist of :

- A. Left homonymous hemianopsia
- B. Visual illusions, hallucinations,
- C. Disturbed topographic memory
- D. Disturbed visual orientation
- E. All of the above

14. A 78 year old woman has a long history of hypertensive vascular disease and also significant problems with vertebral-basilar insufficiency. She sustains a stroke which resulted in bilateral occlusion of the posterior cerebral arteries. The following neurological difficulties may occur **EXCEPT**:

- A. Cortical blindness
- B. Loss of perception of color
- C. Anton's syndrome
- D. Anosmia
- E. Kluver-Bucy syndrome

15. A 26 year old man is in an automobile accident and sustains severe damage to his non-dominant or right temporal lobe. He might experience all of the following **EXCEPT**:

- A. Homonymous upper quadrantanopsia
- B. Trouble judging spatial relationships
- C. Tactile agnosia
- D. Impairment in tests of visually presented non-verbal material
- E. Agnosia for sounds and some qualities of music

16. A 26 year old man with chronic sinus disease develops a left frontal lobe brain abscess. His symptoms consist of all of the following **EXCEPT**:

- A. Right hemiparesis
- B. Auditory delusions
- C. Motor speech disorder with agraphia and possibly some dyspraxia
- D. Decreased verbal associative fluency
- E. Sympathetic apraxia of the left hand

17. What anatomical defect would you expect to see at autopsy of a patient with advanced Parkinson's disease?

- a. an asymmetry in the sizes of the left and right caudate nuclei
- b. a small degenerated nucleus in the rostral diencephalon
- c. abnormally small lateral ventricles
- d. a degenerated nucleus in the midbrain
- e. none of the above

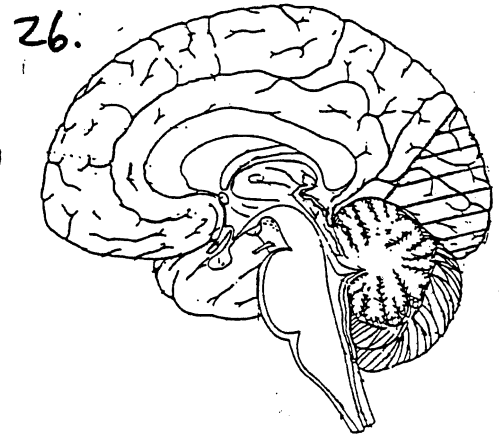
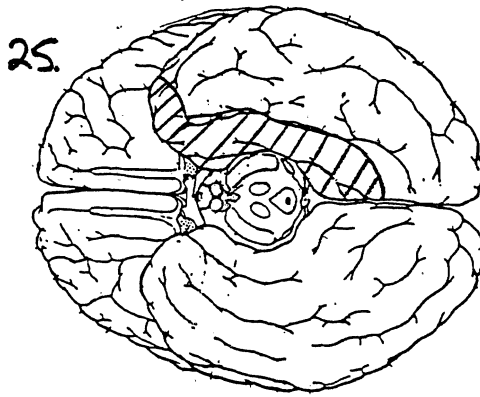
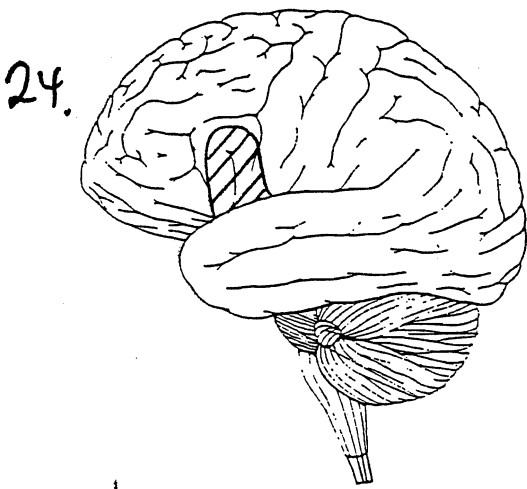
18. The term striatum is used to refer to:
- output nuclei of the basal ganglia, i.e. subthalamic nucleus and globus pallidus
 - basal ganglia input nuclei, i.e. caudate, putamen, and nucleus accumbens
 - visual cortex
 - putamen and substantia nigra
 - putamen, globus pallidus internal segment, and subthalamic nucleus
19. Neurons in the pars compacta and pars reticulata divisions of the substantia nigra differ in which of the following ways?
- Neurons in one are in the diencephalon whereas neurons in the other are in the brainstem
 - Neurons in one are included as part of the input nuclei of the basal ganglia, whereas neurons in the other are not in the basal ganglia
 - Neurons in one are GABAergic whereas neurons in the other are dopaminergic
 - Neurons in one project primarily to thalamus, whereas neurons in the other project primarily to cortex
 - none of the above
20. You are caring for a patient who has a basal ganglia disease and who has recently undergone a pallidotomy (surgical lesion of the globus pallidus). Postsurgery scans indicate the surgery only destroyed the internal globus pallidus. If the direct-indirect pathways model of the basal ganglia is correct, which of the following consequences would be expected from this surgery?
- decreased inhibition delivered to the thalamus by the basal ganglia
 - increased excitation delivered to the output nuclei from the subthalamic nucleus
 - increased inhibition delivered to thalamus from the striatum
 - destruction of only the indirect pathways
 - decreased excitation delivered to prefrontal cortical areas
21. All the following are true about the direct-indirect pathway model of the basal ganglia except:
- the external globus pallidus and subthalamic nucleus are components of the indirect pathway
 - basal ganglia outputs to thalamus are excitatory
 - thalamic inputs to prefrontal cortex are excitatory
 - striatal projections to the internal globus pallidus are inhibitory
 - subthalamic inputs to the pars reticulata are excitatory
22. Which of the following is not true of basal ganglia hyperkinetic disorders?
- they can involve choreas
 - they can involve an increased excitation delivered to prefrontal cortex
 - they can involve death of subthalamic nucleus cells
 - they can involve a decreased inhibition delivered by basal ganglia outputs to thalamus
 - they involve an increase in the influence of the indirect pathway, and a decrease in the influence of the direct pathway, on basal ganglia output nuclei

23. Which of the following statements about dopaminergic neurons in the basal ganglia is **false**?

- a. Dopamine release from dendrites of these neurons directly inhibits pars reticulata neurons.
- b. These neurons may die in Parkinson's disease.
- c. Dopamine release from these axons decreases GABA release from striatal neuron axon collaterals in the striatum.
- d. These neurons are mainly located in the pars reticulata of the substantia nigra.
- e. In the direct-indirect model of the basal ganglia, loss of these neurons results in increased inhibition of thalamus by basal ganglia output nuclei.

For figures 24-26, indicate the best match between the indicated cortical area (cross hatched area) and the following mental or cognitive function

- a. visual perception
- b. personality, emotion,,arousal
- c. speech
- d. planning motor functions
- e. none of the above



Select the best answer.

27. Which of the following statements regarding cortical contributions to normal mental and cognitive functions is **not** true?
- a. a given mental function may be performed unequally in the left and right cortices
 - b. a synchronized EEG state is needed for optimal performance of mental functions
 - c. the temporal lobe is involved in language comprehension
 - d. somatosensory perceptions involve cortical areas in the lateral sulcus
 - e. the arcuate fasciculus is important for language functions
28. You have a patient with a tumor in the left cerebral hemisphere. Surgery to remove the tumor is an option, but you are concerned that language cortical areas may be lost. Which statement about cortical contributions to language functions is **not** true?
- a. about 50% of right handed people have language functions dominantly in the right hemisphere
 - b. about 96% of right handed people have language functions dominantly in the left hemisphere
 - c. about 15% of left or mixed handed people have language functions distributed equally to both hemispheres
 - d. about 15% of left or mixed handed people have language functions dominantly in the right hemisphere
 - e. about 70% of left or mixed handed people have language functions dominantly in the left hemisphere
29. Which of the following statements regarding the dopamine hypothesis of schizophrenia is **not** true?
- a. Dopamine release by ventral tegmental neurons is decreased in the prefrontal cortex of schizophrenics.
 - b. Dopamine release by ventral tegmental neurons is increased in limbic areas of schizophrenics.
 - c. Feedback inhibition from prefrontal cortex to the ventral tegmentum is increased in schizophrenics.
 - d. Feedback inhibition from prefrontal cortex to limbic areas is decreased in schizophrenics.
 - e. This disorder is treated with dopamine receptor blockers.
30. Which statement concerning postganglionic parasympathetic outputs is TRUE?
- A. They excite somatic motor neurons.
 - B. Their activation induces sweating.
 - C. They underlie behaviors making us ready for "fight and flight".
 - D. Their activation causes pupillary dilation.
 - E. None of the above.

31. Which statement concerning postganglionic sympathetic outputs is TRUE?
- A. They emerge from ganglia that are generally more distant from the organ supplied than are parasympathetic ganglia.
 - B. Their activation causes contraction of bronchiolar smooth muscle.
 - C. They generally release acetylcholine onto their target cells.
 - D. Their activation causes contraction of blood vessels in skeletal muscle.
 - E. None of the above.
32. Which statement concerning autonomic regulation of the heart is **FALSE**?
- A. One way acetylcholine slows the heart is by muscarinic receptor activation of K⁺ channels.
 - B. One way norepinephrine speeds the heart is by activating beta-adrenergic receptors which couple to stimulatory G-proteins and lead to increased cAMP production.
 - C. Sympathetic inputs to the heart decrease the force of cardiac muscle contraction.
 - D. Some postganglionic sympathetic projections emerge from the superior cervical ganglion.
 - E. Some preganglionic parasympathetic projections originate in the dorsal motor nucleus of the vagus.
33. Which statement concerning the sympathetic and parasympathetic divisions of the autonomic nervous system is **FALSE**?
- A. They innervate visceral target structures.
 - B. They consist of a two neuron output circuit (from spinal cord).
 - C. They receive descending inputs via the medial tectospinal fasciculus.
 - D. They both modulate the activity of the enteric division of the autonomic nervous system.
 - E. Activity in one division generally antagonizes that in the other.
34. Autonomic afferent (sensory) fibers...
- A. Convey information from the limbs and body wall.
 - B. Are segregated from somatic sensory inputs in the spinal cord.
 - C. Are associated with referred pain.
 - D. Encode information about taste.
 - E. None of the above.
35. For postganglionic sympathetic neurons, name the major type of neurotransmitter synthesized by the neurons, and the major neurotransmitter receptor expressed on the cell surface?
- A. Gamma amino butyric acid (GABA), Glycine.
 - B. Norepinephrine, Acetylcholine (nicotinic).
 - C. Acetylcholine, Acetylcholine (muscarinic).
 - D. Glycine, Glycine.
 - E. N-methyl-d-aspartate (NMDA), Acetylcholine (nicotinic).
36. Autonomic afferents...
- A. Convey sensory information from the viscera.
 - B. May have primary afferent cell bodies in cranial sensory ganglia.
 - C. Generally carry mechanosensory information in parasympathetic nerves.
 - D. Generally carry pain and pressure information in sympathetic nerves.
 - E. All of the above.

37. The lateral region of the hypothalamus...
- A. Is associated with learning and memory.
 - B. Is separated from the medial region by the fornix.
 - C. Lies within the fourth ventricle.
 - D. Is damaged in patients with diabetes mellitus.
 - E. None of the above.
38. Which one of the fiber tracts listed below provides a major connection between amygdala and hypothalamus?
- A. Tuberohypophyseal tract.
 - B. Medial forebrain bundle.
 - C. Stria terminalis
 - D. Fornix.
 - E. Stria medullaris.
39. Which hypothalamic nucleus is most closely associated with production of ADH?
- A. Paraventricular.
 - B. Arcuate.
 - C. Lateral
 - D. Ventromedial.
 - E. Dorsomedial.
40. Which statement about the amygdala is TRUE?
- A. It was included in the original circuit of Papez.
 - B. It integrates motor behavior.
 - C. It lies in the occipital lobe
 - D. It lies in the midbrain.
 - E. It receives inputs from cortical auditory association areas.
41. Hypothalamic neurosecretory cells...
- A. Are confined to the paraventricular nucleus.
 - B. In the arcuate nucleus, project to the general circulation surrounding the posterior pituitary.
 - C. In the arcuate nucleus, project to the portal circulation surrounding the anterior pituitary.
 - D. In the supraoptic nucleus, project to the portal circulation surrounding the anterior pituitary.
 - E. None of the above.
42. Which of the following statements concerning LTP is TRUE?
- A. It is characterized by the observation that for a time period after conditioning tetanic stimulation of the afferents, the individual test synaptic response is depressed.
 - B. It is apparently the synaptic substrate for emotions.
 - C. Its maintenance requires decreased transmitter release.
 - D. Its induction is likely to result from removal of Mg^{++} ions blocking AMPA receptors.
 - E. None of the above.

43. All of the following statements about the hippocampus are true **EXCEPT**?
- A. Most hippocampal inputs and intrinsic neurons utilize glutamate as their transmitter.
 - B. It connects to the mammillary bodies via the postcommissural fornix.
 - C. It is composed of 3 cortical layers.
 - D. Its circuitry has been implicated in learning and memory.
 - E. Since the hippocampus does not appear to play a role in controlling emotions, it is no longer considered a part of the limbic system.
44. Inhibitory cells of the cerebellar cortex include all of the following **EXCEPT** _____ cells
- a. stellate
 - b. Purkinje
 - c. Golgi
 - d. granule
 - e. basket
45. The molecular layer of the cerebellar cortex contains...
- a. Purkinje cell axons
 - b. parallel fibers
 - c. mossy fiber dendrites
 - d. climbing fiber cell bodies
 - e. Purkinje cell bodies
46. The vestibulocerebellum corresponds to the...
- a. anterior lobe
 - b. vermis
 - c. lateral hemispheres
 - d. flocculonodular lobe
 - e. lateral and intermediate hemispheres
47. Climbing fiber and mossy fiber inputs to the cerebellum are similar in their...
- a. points of origin
 - b. effects on granule cells
 - c. synaptic contacts with Purkinje cells
 - d. inhibition of neurons in the dentate nucleus
 - e. excitatory effects on neurons in the dentate nucleus
48. Mr. Rax has a history of heavy alcohol use. From which of the following symptoms could you determine that his alcoholism had affected his cerebellum?
- a. rapid pressured speech
 - b. tremor at rest
 - c. increased muscle tone
 - d. increased resistance to passive movement
 - e. wide based gait

49. Mrs. Bonnet was given an extensive neurological workup and was found to have disease in the neocerebellum. This is most likely to be manifested as difficulties with...

- a. balance
- b. speech
- c. maintenance of muscle tone
- d. deterioration of muscle movement as it progresses
- e. all of the above

50. Which of the following areas of the cerebellum is correctly paired with the deep cerebellar nucleus to which it projects?

- a. vestibulocerebellum :: interposed nucleus
- b. neocerebellum :: dentate nucleus
- c. spinocerebellum :: dentate nucleus
- d. spinocerebellum :: vestibular nuclei
- e. neocerebellum :: locus ceruleus

51. The major source of climbing fiber input to the cerebellar cortex is the...

- a. fastigial nucleus
- b. inferior olivary nucleus
- c. ventral lateral nucleus of the thalamus
- d. pontocerebellar tract
- e. vestibular nucleus

52. Alzheimer's disease...

- A. occurs only after the age of 65.
- B. involves intraneuronal accumulation of β -amyloid.
- C. results from mutations in a single gene.
- D. is defined by the presence of senile plaques and neurofibrillary tangles in the brain.
- E. is produced by an infectious agent.

53. All of the following are associated with increased accumulation of β -amyloid in the brain, **except**:

- A. mutations in the amyloid precursor protein gene.
- B. over-expression of the amyloid precursor protein gene.
- C. mutations in the presenilin genes.
- D. Down Syndrome.
- E. phosphorylation of the tau protein.

54. The formation of neurofibrillary tangles is most closely related to the activity of which of the following proteins?

- A. Acetylcholinesterase
- B. Apolipoprotein E₄
- C. A protein kinase
- D. A protease
- E. Presenilin 1

55. The nasal retina of the left eye contains ganglion cells that may project to...
- the deep layers of the left superior colliculus
 - layer 1 of the right lateral geniculate nucleus
 - layer 3 of the right lateral geniculate nucleus
 - layer 6 of the left lateral geniculate nucleus
 - none of the above
56. Neurons with color sensitive receptive fields are numerous in ...
- the habenula
 - the retinal periphery
 - the parvocellular layers of the lateral geniculate nucleus
 - layer 1 of the lateral geniculate nucleus
 - cortical area 6
57. Ocular dominance columns, as reflected by the responses of cells in the primary visual cortex,...
- encompass all layers
 - are absolute (cells respond to stimulation of one eye exclusively) in lamina IV
 - are created by the terminations of lateral geniculate nucleus axons in area 17
 - all of the above
 - none of the above
58. The information from a red cone in the nasal one half of the left eye is likely to be represented in
- the deep layers of the right hypothalamus
 - MT of the left visual cortex
 - lamina 4 of the right lateral geniculate nucleus
 - the receptive fields of cells in lamina VIII of the right area 18
 - lamina 1 of the right lateral geniculate nucleus
59. Which of the following is **NOT** a characteristic of M ganglion cells?
- small receptive fields.
 - large dendritic trees.
 - insensitivity to color.
 - rapidly conducting axons
 - projections to the magnocellular layers of the lateral geniculate nucleus.
60. Damage to the right optic tract will...
- injure the axons of ganglion cells in the temporal one half of the left retina.
 - result in a heteronymous hemianopsia.
 - cause a scotoma (blind area) in the left visual field.
 - damage the axons of cells in the left visual cortex.
 - none of the above.
61. A patient has a upper temporal quadrantanopsia of the left visual field. The lesion is most likely in...
- the right loop of Meyer
 - the left loop of Meyer
 - the right optic tract
 - the left optic tract
 - none of the above

62. Which of the following statements is true regarding saccadic eye movements?
- They bring a stimulus image onto the fovea
 - They serve to stabilize perception of visual space
 - They keep the image of a moving stimulus on the fovea
 - During head movements, they produce an involuntary correction of eye position proportional to head velocity
 - None of the above
63. Optokinetic nystagmus requires which structure or is elicited by which stimulus?
- Intact semicircular canals
 - Rotation of the body
 - Movement of an image across the retina
 - Normal color vision
 - Irrigation of the ear canal with warm or cold water
64. For the affected eye, damage to the oculomotor nerve would result in...
- An outward deviation of the eye (strabismus)
 - A tendency for the eyes to deviate upward
 - Inward deviation of the eye
 - Hypertrophy of the levator palpebrae muscle
 - Pupillary constriction
65. Which of the following statements about motor neurons is **INCORRECT**?
- they may have their cell bodies located either in the brainstem or spinal cord.
 - their axons project to targets through the peripheral nervous system.
 - both alpha and gamma motoneurons are located in ventral horn motor pools or columns.
 - motor neurons receive monosynaptic inhibitory inputs from muscle spindle 1A afferents
 - transmission from motor neuron axons to skeletal muscles requires acetylcholine release at the synaptic end-plate.
66. Gamma motor neurons exclusively innervate which structure(s)?
- nuclear bag and nuclear chain fibers
 - extrafusal fibers
 - Pacinian corpuscles
 - distal flexor muscles
 - Golgi tendon organs
67. Which pair of terms best fits the sentence: When a muscle contracts, its _____ receptors **DECREASE** action potential frequency in _____ type afferent nerve fibers.
- muscle spindle-Ia
 - muscle spindle-Ib
 - cutaneous nociceptor-IV
 - Golgi tendon organ-Ib
 - Golgi tendon organ-Ia

68. When a muscle is stretched by pulling on its tendon, the most likely consequence would be ...
- a. decreased output of motor neurons to an antagonist muscle.
 - b. decreased output of motor neurons to a synergist muscle.
 - c. decreased activity of type Ia and II endings within spindles of the muscle being stretched
 - d. increase in alpha motor neuron activity to an antagonist muscle
 - e. decrease in gamma motor neuron activity to muscle being stretched
69. In the normal motor system, which of the following conditions would result in, or be associated with, an increment in force exerted by a single muscle during a voluntary movement?
- a. recruitment of larger motor units before smaller ones
 - b. recruitment of fast-fatiguing motor units before slow-non-fatiguing units
 - c. increasing the quantity of acetylcholine released by individual action potentials at the neuromuscular junction
 - d. recruitment of increasing numbers of Renshaw cells
 - e. recruitment of increasingly greater numbers of motor units
70. Occlusion of the anterior spinal artery at cervical levels would most likely spare (inflict the least damage) on which one of the following descending spinal pathways?
- a. lateral corticospinal tract
 - b. pontine reticulospinal tract
 - c. medial corticospinal tract
 - d. lateral vestibulospinal tract
 - e. tectospinal tract
71. Corticobulbar axons typically make bilateral contact onto brainstem nuclei with the notable exception of a portion of which nucleus?
- a. pontine reticular formation
 - b. facial nucleus
 - c. medullary reticular formation
 - d. oculomotor nucleus
 - e. trigeminal motor nucleus
72. Which of the following motor tracts is utilized chiefly for postural support and stability of the lower limbs during head movements?
- a. lateral corticospinal tract
 - b. medial vestibulospinal tract
 - c. lateral vestibulospinal tract
 - d. rubrospinal tract
 - e. raphe-spinal tract

Select from the following list the best answers to the next 4 questions; an answer may be used once, more than once or not at all.

- a. supplementary motor cortex (area 6-medial)
- b. premotor cortex (area 6-lateral)
- c. motor cortex (area 4)
- d. parietal cortex (including areas 1, 2, 3b, 5 and 7)
- e. all of the above

73. Which motor cortical area has (at least some) direct connections to alpha motor neurons?
74. Which cortical area is most directly linked to basal ganglia ("sensorimotor loop") output and is involved in the organization of complex sequences of movement?
75. Which cortical area is the source of axons that travel into the spinal cord?
76. Which cortical area contributes axons to the lateral corticospinal tract that terminate primarily in the dorsal horn of the spinal cord?

(For questions 77 and 78, refer to the following vignette)

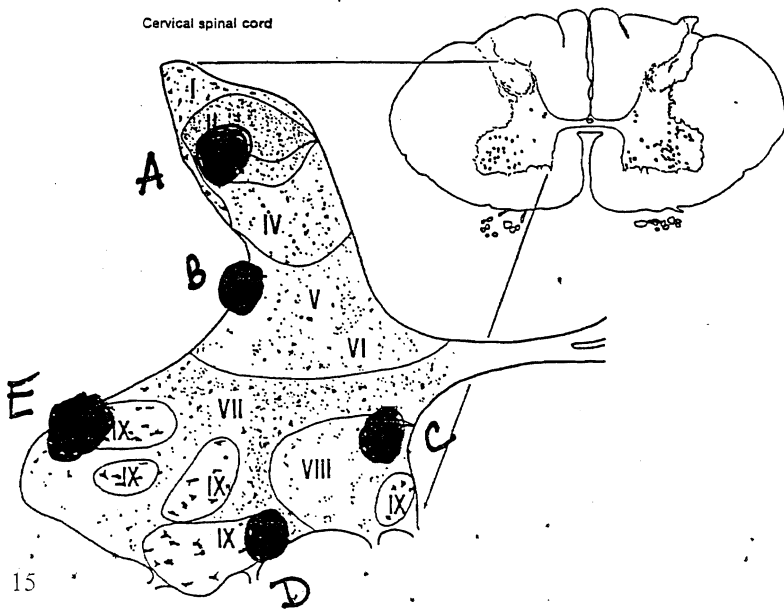
A concert pianist, and former Van Cliburn winner, was in an auto accident and sustained severe damage of the spinal cord at about C7-8. He has hemiplegia with upper motor signs of right upper and lower extremities and fears he will never regain the use of his fingers. He comes to your clinic to attempt restoration of function in his hand by a radical technique. The FDA has recently approved trials for regrowing central motor axon connections by peripheral nerve grafts to bridge narrow areas of spinal cord damage and glial scarring, but the axons cannot grow very far beyond the graft before making synaptic contacts. His chance of any recovery depends on the accuracy of your placements of both ends of the graft.

77. You remove a short piece of peripheral nerve from his paralyzed right leg and place one end in the _____ tract above the damaged area to receive the regrowing axons from the hand region of motor cortex.

- A. ventral corticospinal
- B. lateral corticospinal
- C. ventral spinocerebellar
- D. pontine reticulospinal
- E. tectospinal

78. You then insert the other end in a location identified by its letter on the following diagram:

- A.
- B.
- C.
- D.
- E.



79. The most important modifiable risk factor for stroke in terms of absolute risk is:

- A. Atrial fibrillation
- B. Elevated cholesterol
- C. High blood pressure
- D. Cigarette smoking
- E. Alcohol consumption

80. The most common vascular territory for embolic stroke is:

- A. Anterior cerebral artery
- B. Middle cerebral artery
- C. Posterior cerebral artery
- D. Basilar artery
- E. Anterior communicating artery

81. In cerebral ischemia, all of the following occur **EXCEPT**:

- A. Decrease in energy (ATP) production
- B. Production of free radicals
- C. Increased intracellular calcium
- D. Decreased release of glutamate, an excitatory amino acid
- E. Activation of nitric oxide synthetase and proteases

82. Scalp recorded EEG potentials originate mainly from which neurons?

- a. axons in cortical white matter
- b. thalamic reticular nucleus cells
- c. layer IV cortical granule cells
- d. layer III cortical pyramidal neurons
- e. none of the above

83. Scalp recorded EEG potentials are produced by:

- a. neuronal action potentials
- b. glial cell activity
- c. neuronal pre-synaptic axon potentials
- d. neuronal post-synaptic potentials
- e. potassium currents in epithelial cells

84. Pacemaker neurons involved in cortical rhythm generation are located in:

- a. the reticular activating system
- b. raphe nucleus
- c. the lateral tegmental brainstem nuclei
- d. nucleus basalis
- e. the dorsal thalamic nuclei

This case refers to the following 3 questions

Case 1

A 74 year old man was brought into the emergency room after noticing that his waist and left leg felt different. He had no history of trauma. A neurological exam revealed: normal touch-proprioception in all extremities and face but a left side loss of pain, temperature, and crude touch for all dermatomes from about T8 and below, with the exception of dermatomes associated with S2-5, which were normal. A scan revealed a single, delimited lesion.

85. The sensory loss is most likely due to damage of which structure(s)?
- A. Dorsal root ganglia (or roots) for the dermatomes indicated
 - B. Right lateral medulla
 - C. Anterolateral system axons crossing in the midline at about T8
 - D. Left dorsal column (fasciculus gracilis)
 - E. None of the above
86. What accounts for the **normal** sensory findings in tests of dermatomes S2-S5?
- A. There was no obvious cortical damage
 - B. Sacral level anterolateral fibers are positioned ventrally and laterally to lumbar and thoracic anterolateral fibers
 - C. Pain/temperature fibers for these dermatomes travel to their targets within autonomic pathways
 - D. There is bilateral sensory innervation of these dermatomes
 - E. None of these explanations can account for this sparing of sacral function.
87. The patient was treated with anticoagulant medication. After 6 weeks, he returned to the clinic for a follow-up exam. What motor sign(s) do you think are most likely to be present at this time, given the sensory results.
- A. Wasting of muscles and fasciculations present on the right lower chest or upper abdomen
 - B. Falling to side of lesion (Romberg test with eyes closed)
 - C. Babinski and Bing signs on left foot
 - D. Weakness and loss/reduction of reflexes on left leg
 - E. All of the above

This case refers to the following 5 questions.

Case 2

A 58-year-old man suddenly developed dizziness and unsteadiness. Neurologic examination found nystagmus during right lateral gaze, ataxia on the right, loss of pain and temperature sensation over the right side of the face and the left trunk and extremities, loss of corneal reflex on the right, and falling to the right when trying to stand with eyes closed (Romberg test). Angiography showed considerable arteriosclerosis of the vertebral-basilar arterial system.

88. How many of these symptoms or signs are attributable to an Upper Motor Lesion of corticospinal pathways?
- A. 0
 - B. 1
 - C. 2
 - D. 3
 - E. 4
89. Nystagmus induced by right-directed gaze in the above description is due to
- A. Optokinetic stimulation
 - B. Rotation of the patient's head
 - C. A pathological condition interfering with vestibular or cerebellar communication with eye movement cranial nerve nuclei
 - D. A lesion in the superior colliculus or frontal eye fields
 - E. A lesion in visual cortex
90. The patient's inability to maintain upright stance while closing his eyes is due to a primary defect in:
- A. Motor cortex
 - B. Substantia nigra
 - C. Subthalamic nucleus
 - D. Inferior cerebellar peduncle
 - E. Cerebrocerebellar portion of the cerebellar hemispheres
91. Given the other signs and symptoms as explicitly stated, what is the most parsimonious explanation (involves fewest assumptions) of the loss of the corneal reflex on the right?
- A. Damage to corticobulbar fibers that project to left facial nucleus
 - B. Damage to right side facial motor neurons and/or axons
 - C. Damage to spinal trigeminal tract or nucleus on right
 - D. Damage to cranial nerve III
 - E. Damage to superior cervical ganglion or preganglionic fibers afferent to it
92. An infarct of which artery might produce these symptoms?
- A. Posterior inferior cerebellar or its tributaries
 - B. Anterior inferior cerebellar or its tributaries
 - C. Superior cerebellar, posterior cerebral, or their tributaries
 - D. Posterior communicating artery
 - E. Anterior spinal artery

FINAL EXAM ANSWERS VERSION 1

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|--------|--------|--------|
| 1. E. | 43. E. | 85. E. |
| 2. D. | 44. D. | 86. B. |
| 3. A. | 45. B. | 87. A. |
| 4. E. | 46. D. | 88. A. |
| 5. A. | 47. E. | 89. C. |
| 6. D. | 48. E. | 90. D. |
| 7. D. | 49. B. | 91. C. |
| 8. D. | 50. B. | 92. A. |
| 9. E. | 51. B. | |
| 10. E. | 52. D. | |
| 11. A. | 53. E. | |
| 12. E. | 54. C. | |
| 13. E. | 55. B. | |
| 14. D. | 56. C. | |
| 15. C. | 57. D. | |
| 16. B. | 58. C. | |
| 17. D. | 59. A. | |
| 18. B. | 60. C. | |
| 19. C. | 61. A. | |
| 20. A. | 62. A. | |
| 21. B. | 63. C. | |
| 22. E. | 64. A. | |
| 23. D. | 65. D. | |
| 24. C. | 66. A. | |
| 25. E. | 67. A. | |
| 26. A. | 68. A. | |
| 27. B. | 69. E. | |
| 28. A. | 70. A. | |
| 29. C. | 71. B. | |
| 30. E. | 72. C. | |
| 31. A. | 73. C. | |
| 32. C. | 74. A. | |
| 33. C. | 75. E. | |
| 34. C. | 76. D. | |
| 35. B. | 77. B. | |
| 36. E. | 78. E. | |
| 37. B. | 79. C. | |
| 38. C. | 80. B. | |
| 39. A. | 81. D. | |
| 40. E. | 82. D. | |
| 41. C. | 83. D. | |
| 42. E. | 84. E. | |